IN THE SPECIFICATION

Page 1, between the title of the invention and the first line of the text, insert the following:

CROSS-REFERENCE TO RELATED APPLICATION

This Application is a Section 371 National Stage Application of International Application No. PCT/FR2004/001900, filed July 16, 2004 and published as WO 2005/011144 on February 3, 2005, not in English.

Please remove the heading appearing on page 1, before line 1:

~~DESCRIPTION~~

Please replace the paragraphs appearing on page 1, lines 1-12 with the following amended paragraphs:

~~1. Field of the invention~~

FIELD OF THE DISCLOSURE

The field of the ~~invention~~ disclosure is applied digital communications, digital radio broadcasting systems of the type belonging to the group including DAB, DVB-T, DRM, and also telecommunications (ADSL, Hyperlan2, etc.).

More precisely, the ~~invention~~ disclosure relates to DAB, DVB-T, DRM type receivers that use the OFDM (Orthogonal Frequency Division Multiplex) demodulation, which is used increasingly in the above-mentioned fields.

~~2. Prior art~~

~~2.1. Reminder about the principle of OFDM modulation~~

Page 1, after line 12, insert the following heading:

BACKGROUND OF THE DISCLOSURE

Page 3, line 8, please remove the heading:

~~2.2. Application in AM (DRM) bands~~

Please remove the title appearing on page 4, line 4:

~~2.3. Disadvantages of techniques according to prior art~~

Please replace the paragraphs beginning on page 4, line 25 and ending on page 6, line 9 with the following amended paragraphs:

~~3. Purposes of the invention~~

~~The purpose of the invention is particularly to overcome these main disadvantages of prior art.~~

~~More precisely, one purpose of the invention is to provide a method and a device for optimising the estimate of a propagation channel, particularly an OFDM channel, for example for DRM type applications.~~

~~In particular, another purpose of the invention is the attempt to reduce strong fading that can occur for example in the case of the DRM.~~

~~Another purpose of the invention is to provide a method and a device for correcting reference pilots as a function of a corresponding propagation channel.~~

~~Another purpose of the invention is to provide a method and an estimating device for refining synchronisation of receivers.~~

~~Yet another purpose of the invention is to provide a method and a device that are easy to use while remaining at reasonable cost.~~

~~Another purpose of the invention is to provide a method and a device for also correcting the problem of the common phase error on an OFDM signal in reception, for example induced by oscillator phase noise, complementary to the error on the amplitude common to OFDM symbols.~~

SUMMARY

~~4. Main characteristics of the invention~~

~~These objectives and others that will appear later are achieved by means of~~ An embodiment of the invention is directed to a method of estimating a propagation channel formed by successive symbols of a multi-carrier signal each comprising at

least one reference pilot and a plurality of frequencies carrying data.

In one or more embodiments, such~~Such~~ a method advantageously comprises at least one step to correct the reference pilot(s) as a function of a first estimate of a propagation channel, so as to create a second more precise second channel estimate.

This approach is based, for example, ~~particularly~~ on the observation made by the inventors that currently known algorithms in solutions according to prior art do not use all information that can be extracted from reference pilots.

Please replace the paragraphs beginning on page 6, line 20 and ending on page 7, line 13 with the following amended paragraphs:

~~Preferably~~In one or more embodiments, the correction step includes a step to calculate an amplitude and / or phase error vector for each of the reference pilots.

~~Preferably~~In one or more embodiments, the error vector calculation step includes averaging of a set of error vectors obtained on at least one symbol. For example, this averaging can correspond to an integration on error vectors obtained for each symbol, so as to eliminate any risk of introducing noise that could be generated due to the use of atypical pilots.

Advantageously, in one or more embodiments, averaging is calculated on each symbol.

Advantageously, in one or more embodiments, the set of error vectors only includes error vectors that satisfy at least one predetermined quality criterion.

~~Preferably~~In one or more embodiments, the calculation step for an amplitude and / or phase error vector comprises a preliminary rejection step for this calculation to reject pilots with an amplitude less than a first predetermined minimum average threshold and / or greater than a second predetermined maximum average threshold, so as to prevent any risk of introducing a bias into the calculation of the amplitude and / or phase error

vector.

Please amend the paragraph appearing on page 7, lines 18-21 with the following amended paragraph:

On the other hand, the method according to an embodiment of the invention makes it possible to demodulate all pilots to extract a common estimate applicable to the channel, by applying the channel estimate on the data themselves.

Please amend the paragraphs appearing on page 8, line 1 and ending on page 10, line 13 with the following amended paragraphs:

Advantageously, in one or more embodiments, the second estimate includes an equalisation step that depends on the first channel estimate.

Advantageously, in one or more embodiments, the equalisation step is performed on all carrier frequencies of each symbol.

Also advantageously, in one or more embodiments, the equalisation step is followed by a step to calculate a pulse response of a propagation channel as a function of reference pilots equalised for refining synchronisation of receivers in time.

~~Preferably~~ In one or more embodiments, the reference pilot correction step includes a division of these pilots by the first propagation channel estimate.

~~Preferably~~In one or more embodiments, the correction step of the reference pilots also includes a final correction step for all equalised useful carriers taking account of the average value obtained as a result of averaging.

The method according to an embodiment of the invention is used advantageously for correction of at least one phase and / or amplitude error common to two cells in the same OFDM (Orthogonal Frequency Division Multiplex) type symbol.

~~The~~An embodiment of the invention also relates to a propagation channel estimating device formed of successive

symbols of a multi-carrier signal each comprising at least one reference pilot, and a plurality of data carrier frequencies.

In one or more embodiments, such~~Such~~ a device thus preferably includes means of correction of the reference pilot(s) as a function of a first estimate of the propagation channel, so as to output a second more precise channel estimate.

~~5. List of figures~~

Other characteristics and advantages of one or more embodiments of the invention will become clearer after reading the following description of a preferred embodiment given as a simple illustrative and non-limitative example and the attached drawings~~ among which:~~.

BRIEF DESCRIPTION OF THE DRAWINGS

[[-]] Figure 1, already described in the preamble, is a time / frequency view of an OFDM channel broken down into cells, the channel then being composed of a sequence of frequency sub-bands and a sequence of time segments;

[[-]] Figure 2, also described above, presents a set of OFDM symbols;

[[-]] Figure 3 shows an example of an OFDM structure in mode A of a set of DRM symbols;

[[-]] Figure 4 shows a second example of an OFDM structure, but for a set of DVB-T symbols;

[[-]] Figure 5 is a diagrammatic description of the functional algorithm of ~~the~~a method according to an embodiment of the invention~~, and is described in detail below~~;

[[-]] Figure 6 gives an example of the determination of a global error vector starting from seven error vectors obtained for N = 7 pilots respectively~~. It is described in detail below.~~; and

[[-]] Figure 7 gives an example of results obtained without application and with application of ~~the~~an algorithm according to an embodiment of the invention on an experimental broadcast of a DRM signal from a tower at a frequency of 26 MHz with mode A~~. It~~and demonstrates the residual error in the channel estimate before and after application of common error corrections. ~~It is~~

~~described in detail in section 7.2 of the description of a preferred embodiment of the invention.~~

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

~~6. Remainder of the general principle of the invention~~

~~Therefore,~~ An embodiment of the invention is intended to correct one or several phase and/or amplitude errors common to cells included within the same OFDM symbol, so as to optimise the estimate of an OFDM channel.

Please replace the paragraphs appearing on page 11, lines 5-24 with the following amended paragraphs:

~~7. Description of a preferred embodiment of the invention~~

Therefore, with the method according to an embodiment of the invention, it is possible to determine the phase rotation of an OFDM symbol after channel correction. Such a technique provides a means of compensating for phase variations output from receiver oscillators, but it is also possible to determine amplitude variations common to a symbol. These two items of information can be used to monitor variations of the channel at the rate of symbols in the time domain.

According to a one or more preferred embodiments of the invention, the objective is to correct a phase and amplitude error common to cells included within the same OFDM symbol. This technique can be used to monitor channel variations at the rate of OFDM symbols, which is much better than what is possible with a conventional channel estimate due to the time and frequency distribution of reference pilots that are often limited in number so as to not reduce the throughput excessively.

Please replace the paragraph appearing on page 15, lines 5-17 with the following amended paragraph:

Figure 7 illustrates an example of the results obtained without application and with application of the algorithm according to an embodiment of the invention, on an experimental

broadcast of a DRM signal from a tower at a frequency of 26 MHz in mode A (that has a reference pilot every 20 cells in frequency and every 5 cells in time). The audio service 71 is highly disturbed when moving near to the tower at 50 km/h: the uncorrected channel 72 comprises troughs and nodes 73, which recur more frequently than is possible with the selected OFDM mode. With the technique according to an embodiment of the invention, the audio service 71 after correction operates perfectly as illustrated by reference 74.

Please replace the paragraph beginning on page 15, line 24 and ending on page 16, line 2 with the following amended paragraph:

~~8. Advantages of the solution according to the invention~~

The method and device for estimating a propagation channel formed by successive symbols of a multi-carrier signal each comprising at least one reference pilot and a plurality of frequencies carrying data as proposed according to an embodiment of the invention may have a number of advantages, given in the following non-exhaustive list:

Please add on page 16, after line 14 the following paragraphs:

A purpose of an embodiment of the invention is particularly to overcome the main disadvantages of prior art techniques.

More precisely, one purpose of an embodiment of the invention is to provide a method and a device for optimising the estimate of a propagation channel, particularly an OFDM channel, for example for DRM type applications.

In particular, another purpose of an embodiment of the invention is the attempt to reduce strong fading that can occur for example in the case of the DRM.

Another purpose of the invention is to provide a method and a device for correcting reference pilots as a function of a

corresponding propagation channel.

Another purpose of an embodiment of the invention is to provide a method and an estimating device for refining synchronisation of receivers.

Yet another purpose of an embodiment of the invention is to provide a method and a device that are easy to use while remaining at reasonable cost.

Another purpose of an embodiment of the invention is to provide a method and a device for also correcting the problem of the common phase error on an OFDM signal in reception, for example induced by oscillator phase noise, complementary to the error on the amplitude common to OFDM symbols.

Although the present invention has been described with reference to one or more embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention.